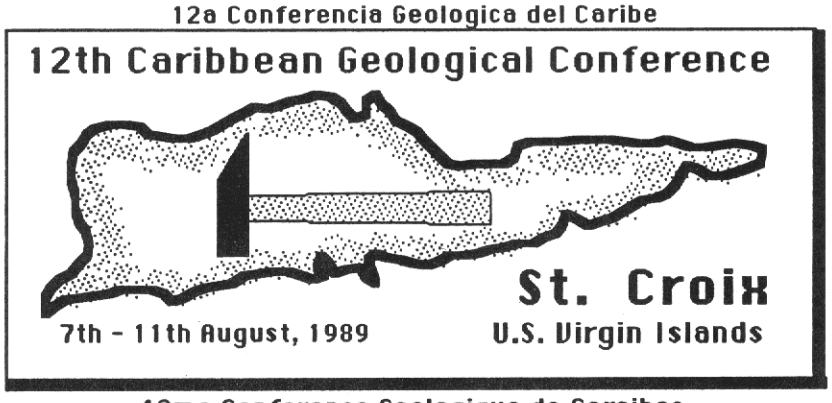
TRANSACTIONS OF THE 12TH CARIBBEAN GEOLOGICAL CONFERENCE

ST. CROIX, U.S. VIRGIN ISLANDS

August 7th - 11th, 1989



Edited by

David K. Larue
Department of Geology, University of Puerto Rico
Mayagüez, PR 00708, Puerto Rico

and

Grenville Draper
Department of Geology, Florida International University
Miami, FL 33199
U.S.A.

Additional copies of this book may be purchased from

Miami Geological Society
P.O. Box 431552
South Miami, FL 33243, U.S.A.

December 1990

ACTIVE TECTONICS OF THE CHORTIS BLOCK

Mark B. Gordon
Department of Geological Sciences
The University of Texas at Austin
Austin, TX 78713-7909, U.S.A.

Michael J. Kozuch
Cuerpo de Paz
Apartado Postal 3158
Tegucigalpa, Honduras
Central America

William R. Muehlberger
Department of Geological Sciences
The University of Texas at Austin
Austin, TX 78713-7909, U.S.A.

ABSTRACT

Internal deformation of the Chortís block (Honduras, El Salvador and environs) is controlled by two well defined, seismically active plate boundaries on the north and on the southwest. Much of the Chortís Block is included in either the Caribbean/Cocos plate boundary zone (convergence rate = 8 cmyr^{-1}; Burbach et al., 1984) or the Caribbean/North American plate boundary zone (slip rate < 2 cmyr^{-1}; Rosencrantz et al., 1988).

The Nicaraguan depression is a marginal basin responding to subduction from the Middle America Trench and is parallel to the Quaternary volcanic line. The depression crosses the Gulf of Fonseca and continues into El Salvador where it is not as prominent a topographic feature (Wiesemann, 1975). It is absent in Guatemala and the volcano line rests on a topographic ridge.

The Motagua and Polochic faults are the two major, active Caribbean/North American plate boundary faults in Guatemala. Several faults with similar orientations occur south of these faults within the present Chortís block. The most prominent of these faults is the inactive Jocotán-Chamelecón fault and is being cut by north-striking normal faults (Clemons, 1966). However, the Aguan and La Ceiba faults of northern Honduras may be active. The Caribbean/Cocos plate boundary is much more seismically active than the Caribbean/North American plate boundary. The intraplate deformation of the Chortís block, paradoxically, seems to result primarily from motions along the Caribbean/North American plate boundary.

North-trending, normal fault-bounded basins define the Honduras depression (Muehlberger, 1976), a major zone of intraplate deformation entirely within the Chortís block. It is seismically active as demonstrated by instrumentally recorded earthquakes (NEIC Catalog), historical earthquakes (Osiecki, 1981), and Quaternary fault scarps (Everett and Fakundiny, 1976). Recent volcanism is also associated with the Honduras depression (Williams and McBirney, 1969). The principal basins are connected by a series of poorly defined strike-slip faults which strike northwest (Emmet, 1983). These faults are parallel to Late Cretaceous folds and, thus, may be reactivated. Other, smaller basins (e.g., the Jesús de Otoro basin) occur off the principal axis of the Honduras depression. The region as a whole is experiencing northwest-striking dextral shear which reactivates old faults and forms extensional basins between principal fault segments. The most prominent extensional corridor of the Sula valley, Lake Yojoa and the Comayagua Valley (the Honduras depression as defined by Muehlberger, 1976) probably represents the most profound preexisting weakness. Other north-trending extensional basins occur south of the Caribbean/North American plate boundary in Guatemala (e.g., the Guatemala City and Ipala grabens). These basins are active as shown by aftershocks from 1976 Guatemalan earthquake. The aftershocks progressed to the west along the Motagua fault and then to the south along the basin bounding normal faults. This aftershock pattern indicates that north-striking normal faults form within the Chortís block as a result of strike-slip faulting on the plate boundary (Plafker, 1976).

The Guayape fault is the longest, continuous structural feature in Honduras. It extends 300 km southwest from the Caribbean coast to the Jamastrán Valley region. The Choluteca lineament, a possible extension of the fault, continues through Neogene volcanic deposits to the Gulf of Fonseca. Ritchie and Finch (1984) first recognized the Guayape fault as a strike-slip fault. In spite of its sharp, well-defined topographic signature, little seismic activity in this region was found in the NEIC Catalog between 1963 and 1983, or from the historical record (Osiecki, 1981). Our recent geologic mapping in the Catacamas Valley and the geometry of other basins show that the Guayape fault has at present a right-lateral sense of slip, although earlier deformation appears to have been left-lateral (Gordon, 1987). Even though the Guayape fault represents important intraplate deformation, a direct relationship between it and the deformation at the plate boundary is not readily apparent.

REFERENCES

Burbach, G.V., Frohlich, C., Pennington, W.D., and Matumoto, T., Seismicity and tectonics of the subducted Cocos plate, J. Geophys. Res., 89.

Larue, D.K., and Draper, G. (eds.),
Transactions of the 12th Caribbean Geological Conference, St. Croix, U.S.V.I., Miami Geological Society, P.O. Box 431552, South Miami, FL 33243, U.S.A

7719-7735, 1984.
Clemons, R.E., Geology of the Chiquimula quadrangle, Guatemala, Central America [Ph.D. Diss.], University of Texas, Austin, 124 p., 1966.
Emmet, P.A., Geology of the Agalteca quadrangle, Honduras, Central America [M.A. thesis], University of Texas, Austin, 201 p., 1983.
Everett, J.R., and Fakundiny, R.H., Structural geology of El Rosario and Comayagua quadrangles, Honduras, Central America *in* Informe y trabajos tecnicos presentados en la IV Reunion de Geologos de America Central, Publ. Geol. ICAITI, no. V, 31-42, 1976.
Gordon, M.B., The Guayape fault of Honduras: a major right-lateral fault cutting the Chortis block, EOS (Trans. Am. Geophys. Un.), 68, 423, 1987.
Muehlberger, W.R., The Honduras Depression *in* Informe y trabajos tecnicos presentados en la IV Reunion de Geologos de America Central, Publ. Geol. ICAITI, no. V, 43-51, 1976.
Osiecki, P.S., Estimated intensities and probable tectonic sources of historic (pre-1898) Honduran earthquakes, Bull. Seismol. Soc. Am., 71, 865-881, 1981.
Plafker, G., Tectonic aspects of the Guatemala Earthquake of 4 February, 1976, Science, 193, 1201-1208, 1976.
Ritchie, A.W., and Finch, R.C., Guayape fault system of Honduras, Geol. Soc. Am. Abstr. Progs., 16, 635, 1984.
Rosencrantz, E., Ross, M.I., and Sclater, J.G., Age and spreading history of the Cayman Trough as determined from depth, heat flow, and magnetic anomalies, J. Geophys. Res., 93, 2141-2157, 1988.
Wiesemann, G., Remarks on the geologic structure of the Republic of El Salvador, Central America, Mitt. Geol.-Paläont. Inst. Univ. Hamburg, 44, 557-574, 1975.
Williams, H., and McBirney, A.R., Volcanic history of Honduras, Univ. Calif. Publ. Geol. Sci., 85, 101 p., 1969.